REMARKS

Claims 1-28 are all the claims currently pending in the application. Claims 8-10 and 21-26 have been withdrawn from consideration as being drawn to a non-elected invention. In view of the following remarks, reconsideration and further examination are requested.

Claim Rejections under 35 U.S.C. § 103(a)

Claims 1-4, 7, 12 and 13 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent No. 6,285,768 to Ikeda in view of US Patent No. 7,181,026 to Zhang et al. Claims 5 and 6 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ikeda in view of Zhang et al. and further in view of US Patent No. 7,020,291 to Buck et al. Claim 11 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ikeda in view of Zhang et al. in view of US Patent No. 6,404,886 to Yoshida et al.

Claims 14-17 and 20 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ikeda in view of Yoshida et al. Claims 18 and 19 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ikeda in view of Yoshida et al. and further in view of Buck et al.

Claims 27 and 28 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ikeda in view of Zhang et al. and further in view of US Patent No. 5,548,335 to Mitsuhashi et al.

Applicants respectfully submit that claims 1-7, 11-20, 27 and 28 are patentable over the combination of references for the following reasons.

Independent claims 1, 14 and 27 recite a combination of elements, *inter alia*:

"…an adaptive filter section for generating a signal indicative of a signal component of the target sound included in the noise reference signal generated by the signal generating section by performing, by an adaptive filter included in the adaptive filter section, a filtering process on the main signal generated by the signal generating section, and for learning a filter coefficient only when the determining section determines that the level ratio is larger than the predetermined value;

a subtracting section for subtracting the signal generated by the adaptive filter section from the noise reference signal generated by the signal generating section…" [Claim 1]

"…an adaptive filter section for generating a signal indicative of a signal component of the target sound included in the noise reference signal generated by the signal generating section by subjecting the main signal generated by the signal generating section to a filtering process at an adaptive filter included in the adaptive filter section, and for learning a filter coefficient only when the determining section determines that the level ratio is larger than the predetermined value;

a subtracting section for subtracting the signal generated by the adaptive filter section from the noise reference signal generated by the signal generating section…" [Claim 14]

"…an adaptive filter section for generating a signal indicative of a signal component of the target sound included in the noise reference signal generated by the signal generating section by performing, by an adaptive filter included in the adaptive filter section, a filtering process on the main signal generated by the signal generating section, and for learning a filter coefficient only when the determining section determines that the level ratio is larger than the predetermined value;

a subtracting section for subtracting the signal generated by the adaptive filter section from the noise reference signal generated by the signal generating section…" [Claim 27]

Accordingly, in independent claims 1, 14 and 27 of the present invention an "accurate" noise signal is obtained ("a signal indicative of a signal component of the target sound") using the adaptive filter, and a noise component included in a main signal is removed by the subtracting section using the "accurate" noise signal ("the signal generated by the adaptive filter section from the noise reference signal"). Therefore, in the present invention, in order to obtain an "accurate" noise signal (i.e., in order to remove a target sound included in a noise reference signal), a signal obtained by filtering the main signal with an adaptive filter is subtracted from a noise reference signal.

In contrast, conventional microphone devices focus on suppressing additive noise (which is different from the target sound) by simply removing a noise component from a main signal. The base reference Ikeda has a configuration which is similar to such conventional microphone devices which do not use an adaptive filter as recited in the independent claims.

Ikeda (the base reference used in rejecting all three independent claims) discloses a noise cancelling method and noise cancelling unit. A (reference) noise signal "x(k)" is simply removed from a main (received) signal "y(k)" as shown in Fig. 2. Further, a subtracter 13 subtracts a pseudo noise signal $r_1(k)$ output by an adaptive filter 12 from a signal delayed by a delay circuit 11, which receives the received signal y(k).

Applicants respectfully submit that the noise suppression methods of Ikeda using a signal inputted to and a signal outputted from an adaptive filter 4 and a subtracter 5 and those in the present invention are different for the following reasons.

Specifically, the adaptive filter section in the present invention receives the main signal and generates a signal indicative of a signal component of the target sound (included in the noise reference signal) by filtering the main signal with the adaptive filter. On the other hand, the adaptive filter 4 in Ikeda receives the signal "x(k)" which is a reference noise signal and generates a pseudo noise signal (Fig. 2; column 2, lines 4 -17).

Moreover, the subtracting section in the present invention subtracts, from the noise reference signal, a signal (signal indicative of a signal component of the target sound) generated by the adaptive filter section. On the other hand, the subtracter 5 in Ikeda subtracts the pseudo noise signal from the main signal.

Accordingly, Applicants respectfully submit that the base reference Ikeda fails to disclose at least an adaptive filter section and a subtracting section as recited in independent claims 1, 14, and 27 of the present invention. Additionally, the Examiner correctly acknowledges that Ikeda does not disclose a noise suppressing section regarding claims 1 and 27 and a reflection information calculating and correcting section regarding claim 14.

The Examiner cites Zhang et al. (claims 1 and 27) and Yoshida et al. (claim 14) in an attempt to cure the deficiencies of Ikeda.

Zhang et al. teach a post-processing scheme for an adaptive directional microphone system with noise/interference suppression. In Figure 3 of Zhang et al. a first signal m1(n) is delayed by a delay circuit 23 to generated a delayed signal m1(n-Δ). An adaptive filter 21 is used to estimate a component in the delayed signal m1(n-Δ) due to sounds coming from a first direction and outputs a filter output signal y1(n). The delayed signal m1(n-Δ) is subtracted by the filter output signal y1(n) to get an error signal e1(n). Adaptive filter 21 receives a second signal m2(n) as a reference signal and the error signal e1(n). The error signal e1(n) is input into

a post-processing circuit 32 to produce a new signal e2(n). When a desired sound comes from the null direction and meanwhile undesired sounds come from the other directions, the undesired sounds can be canceled and the desired sound can be retained by said adaptive filtering circuit 7 in the noise canceling microphone system.

Therefore, similar to Ikeda, in Zhang et al., a (reference) noise signal m2(n) is simply removed from a main (received) signal m1(n) as shown in Fig. 3. Further, a noise signal y1(n) output by an adaptive filter 21 is subtracted from a signal delayed by a delay circuit 23, which receives the received signal m2(n). In contrast with the present invention, the adaptive filter 21 in Zhang et al. receives the signal m2(n) which is a reference noise signal and generates a noise signal y1(n) (Fig. 3; column 5, lines 20 - 45). In addition, an adder 22 in Zhang et al. subtracts the noise signal y1(n) from the main signal.

Yoshida et al. teach a method and apparatus for echo cancelling with multiple microphones. Echo canceller EC1 includes first adaptive filter ADF1 and echo canceller EC2 includes second adaptive filter ADF2. In Figure 9, a difference between two delay values td1 and td2 is stored in a delay register 46 and supplied to a sliding adder 47 that receives two residual signals E1, E2 from echo cancellers EC1 and EC2.

Therefore, similar to Ikeda and Zhang et al., in Yoshida et al. a (reference) noise signal P1 is simply removed from a main (received) signal S1 as shown in Fig. 7. Further, noise signal Res1 output by an adaptive filter ADF1 is subtracted from a signal S1, which receives the received signal P1. In contrast with the present invention, the adaptive filter ADF1 in Yoshida et al. receives the signal P1 which is a reference noise signal and generates a noise signal Res1 (Fig. 7; column 7, line 34 to column 8, line 20). In addition, an adder 37 in Yoshida et al. subtracts the noise signal from the main signal.

Accordingly, both Zhang et al. and Yoshida et al. fail to cure the deficiencies of Ikeda regarding the adaptive filter section and subtracting section recited in independent claims 1, 14 and 27. Thus, for these reasons, a person having ordinary skill in the art clearly would not have found it obvious to modify Ikeda et al., or to make any combination of the references of record, in such a manner as to result in or otherwise render obvious the present invention of claims 1, 14 and 27.

Further, regarding claim 5, the Examiner cited Buck et al. as allegedly teaching a signal generating section. The configuration described in claim 5 is, for example, as shown in Figure 16A. Specifically, in this configuration, a signal amplifying section 150 is located only in the route m1 for obtaining a main signal, but not located in the route m2 for obtaining a noise reference signal. A delaying section 111 is located so as to connect to both of the routes.

A main axis direction of the directivity of the main signal is the same as a main axis direction of the directivity of the noise reference signal. A minimum sensitivity direction of the directivity of the main signal is the same as a minimum sensitivity direction of the directivity of the noise reference signal. A sensitivity in the minimum sensitivity direction of the directivity of the main signal is different from a sensitivity in the minimum sensitivity direction of the directivity of the noise reference signal. Thereby, Figure 16B show how these directivity characteristics of the main signal and the noise reference signal can be arranged. This allows a reduction in a difference between the sensitivity of the main signal and the sensitivity of the noise reference signal in directions other than the target sound direction, whereby an accurate noise signal can be obtained even if the noise source direction is in any direction other than the target sound direction.

Buck et al. teach a noise reduction method with self-controlling interference frequency. However, Buck et al. does not teach or suggest all the features recited in claim 5, namely, "an amplifying section" which is located only in the route for obtaining the main signal and a delaying section located so as to connect to both of the routes for obtaining the main signal and for obtaining the noise reference signal. Instead, the "Gain" in Figure 4A (which is a gain compensation between the two channels), referred to as the amplification section by the Examiner, does not appear to be located only in the route for obtaining the main signal P.

Thus, for these reasons, a person having ordinary skill in the art clearly would not have found it obvious to modify Ikeda et al., or to make any combination of the references of record, in such a manner as to result in or otherwise render obvious the present invention of claim 5 and claim 6, which is dependent therefrom.

Finally, regarding claims 27 and 28, the Examiner cited Mitsuhashi et al. as allegedly teaching an audio recording section.

Mitsuhashi et al. teach a dual direction video camera having operator voice cancellation and control. Even *assuming arguendo* that Mitsuhashi et al. teach an audio recording apparatus, a person having ordinary skill in the art clearly would not have found it obvious to modify Ikeda et al., or to make any combination of the references of record, in such a manner as to result in or otherwise render obvious the present invention of claim 27 and claim 28, which is dependent therefrom at least for the reasons discussed above.

Accordingly, independent claims 1, 14 and 27, as well as claims 1-7, 11-13, 15-20 and 28 which depend therefrom, are clearly allowable over the prior art of record. Therefore, Applicants respectfully request that the rejections under 35 USC 103(a) be withdrawn.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may best be resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Takeo KANAMORI et al.

/Teresa M. Arroyo/
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By: _____
Teresa M. Arroyo
Registration No. 50,015
Attorney for Applicants

TMA(DMO)/
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
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